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SciFYI
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Department of Natural Resources and Parks
Water and Land Resources Division
A science section digest of current environmental issues in King County
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Lake Sammamish Water Quality Response to Land Use Change

Rachael Gravon and Deb Bouchard

As the sixth largest lake in Washington and the second largest in King County, Lake Sammamish is designated a water of state wide significance and is an important and valuable natural resource. It is one of the major recreational lakes in King County and in 2014 was selected as one of eight national urban wildlife refuge programs by the United States Fish and Wildlife Service. There are both State and County parks along the shore, and the lake is utilized by fishermen, boaters, water skiers, and picnickers. The lake is also host to numerous homes and residences, and supports an array of wildlife.

The Lake Sammamish Water Quality Response to Land Use Change Study evaluated data collected from the 1960s through 2011 to describe how Lake Sammamish has responded to watershed development, in particular nutrient inputs associated with that development. The study focuses on total phosphorus, chlorophyll-a, and water clarity, parameters often used in lake management to estimate a lake's productivity, or potential for producing excessive algal growth. The study is part of the ongoing King County Major Lakes Monitoring Program that assesses water quality in Lake Washington, Lake Sammamish, and Lake Union. Both the King County Major Lake and Stream Monitoring Programs are designed to protect the significant investment in freshwater quality improvement and protection made by the people of King County.

Water quality monitoring of Lake Sammamish began in the early 1960s when the Municipality of Metropolitan Seattle (METRO; now merged with King County Department of Natural Resources and Parks) conducted a study of Lake Sammamish water quality to determine if sewage discharged from the City of Issaquah's wastewater treatment plant and a large dairy facility were having an adverse effect on the lake. As a result of this study, wastewater diversion was proposed for Lake Sammamish in order to reduce the total phosphorus inputs into the lake. The diversion decreased the external total phosphorus load to the lake by about 35 percent, and led to a decrease in phosphorus from 32 µg/L to below 20 µg/L (**Figure 4**). Additionally, chlorophyll-a (a pigment found in algae) declined and water clarity increased, providing evidence that diversion was effective in improving water quality.

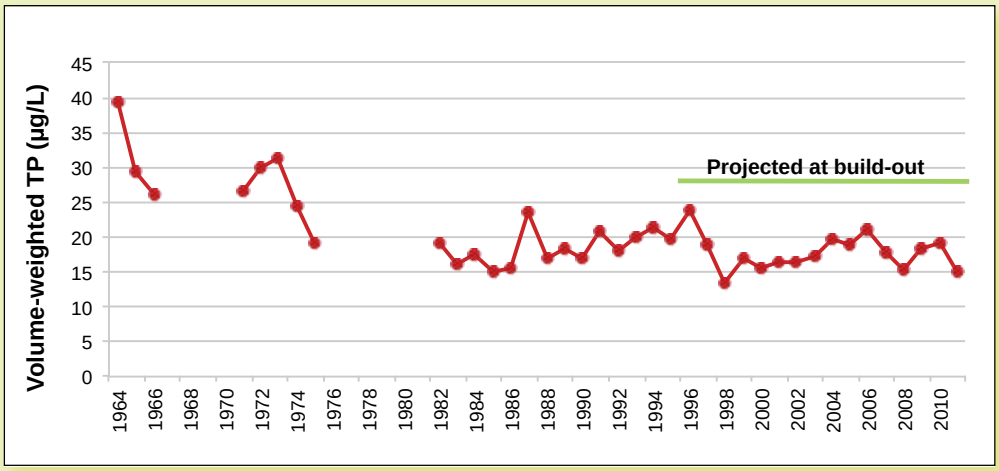

FIGURE 4.
Mean annual whole lake volume-weighted total phosphorus in Lake Sammamish, compared with projected at full build-out. Gaps in monitoring data occur between from 1967-1970, and 1976-1981.

Research in the 1970s and 1980s documented the threat of increasing phosphorus in runoff from impervious surfaces as watershed development increased. Between 1970 and 1990 the percent of developed area in the Lake Sammamish watershed more than doubled – from 15 percent to 36 percent. This increase was primarily due to an increase of single family residences in the

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Issaquah Creek Basin and the East Side Sub-basin (**Figure 5**). Consistent with the research, annual mean phosphorus levels in the lake were consistently over 20 µg/L by the mid-1990s, likely related to the increased urbanization surrounding the lake. A modeling effort in 1995 predicted that phosphorus levels would continue to increase further to 28 µg/L at build-out if measure were not taken.

Concerns about lake water quality influenced the establishment of the inter-jurisdictional Lake Sammamish Initiative, and a citizen's task force, Partners for a Clean Lake Sammamish. Together, these groups worked to complete the 1996 Lake Sammamish Water Quality Management Plan. The plan called for long-term watershed protections involving forest retention and stormwater controls placed on new development to retain phosphorus, as well as short-term actions to reduce phosphorus loading to the lake. In addition, two other multi-jurisdictional basin planning efforts were completed in 1994 (East Lake Sammamish and Issaquah Creek) to protect water quality. In 1998, King County implemented its Surface Water Design Manual, and in 2001, the State Stormwater Management Manual for Western Washington.

The assessment of lake conditions in this study showed that mean annual total phosphorus has not changed significantly between 1980 and 2011, even though there has been substantial population growth in the basin and a significant increase in the amount of impervious area. The apparent increase observed in the mid-1990s leveled off over time and did not match modeled projections. Additionally, mean summer chlorophyll-a has remained stable (about 3.5 µg/L), and summer water transparency has averaged over 5.0 meters since 1998.

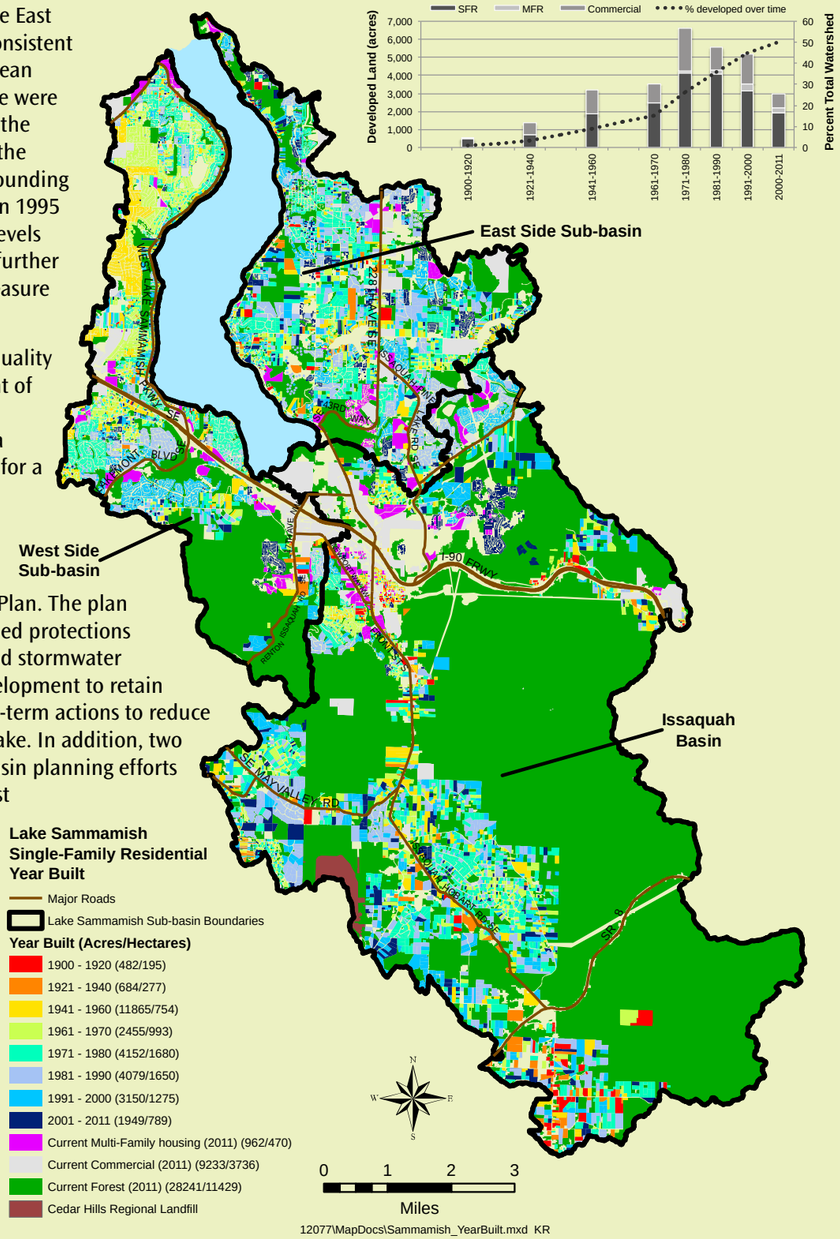

FIGURE 5.
Single-family residential land use built by decade and current multi-family, commercial, and forest land use (2011).

The full Lake Sammamish Water Quality Response to Land Use Change report can be found at: http://your.kingcounty.gov/dnrp/library/2014/kcr2654/kcr2654-rpt.pdf.

To view or download Lake Sammamish water quality data, please visit the King County Major Lakes Monitoring Page at: http://green2.kingcounty.gov/lakes/.

Contributors to King County's Sci FYI

Debra Bouchard

Debra Bouchard has been a senior limnologist/water quality planner with the King County Science and Technical Support Section since 1999. She manages the County's Swimming Beach Monitoring Program and co-manages the Lakes and Streams Routine Monitoring programs.

Rachael Gravon

Rachael Gravon joined the Science and Technical Support Section in 2013 as a water quality planner and limnologist. Rachael received her Master's degree in Freshwater Ecology from Western Washington University, where she studied relationships between lake water quality and freshwater algae populations and participated in numerous lake and stream monitoring programs. She provides technical support on various projects involving lake, stream, and watershed management.

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Send questions, comments and future story ideas to:

Kate O'Laughlin - kate.olaughlin@kingcounty.gov, 206-477-4789

Jim Simmonds - jim.simmonds@kingcounty.gov, 206-477-4825

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